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4. Interpret each diagram to determine the multiplication sentence.

a) $(3c)(3c) = 9c^2$

b) $m(m + 3) = m^2 + 3m$

c) $2r(r + 2) = 2r^2 + 4r$

6. The display models $2n(2n + 1)$. This matches part c.

7. a) $3x(2x + 1) = 3x(2x) + 3x(1)$
 $= 6x^2 + 3x$

b) $4x(2x + 7) = 4x(2x) + 4x(7)$
 $= 8x^2 + 28x$

12. I used the distributive property to determine each product.

a) $2x(x + 6) = 2x(x) + (2x)(6)$
 $= 2x^2 + 12x$

b) $3t(5t + 2) = 3t(5t) + (3t)(2)$
 $= 15t^2 + 6t$

c) $-2w(3w - 5) = (-2w)(3w) + (-2w)(-5)$
 $= -6w^2 + 10w$

d) $-x(2 + 8x) = (-x)(2) + (-x)(8x)$
 $= -2x - 8x^2$

e) $3g(-5 - g) = 3g(-5) + 3g(-g)$
 $= -15g - 3g^2$

f) $(4 + 3y)(2y) = 4(2y) + 3y(2y)$
 $= 8y + 6y^2$

g) $(-7s - 1)(-y) = (-7s)(-y) + (-1)(-y)$
 $= 7sy + y$

h) $(-3 + 6r)(2r) = (-3)(2r) + 6r(2r)$
 $= -6r + 12r^2$

14. The student calculated $(-2d)(-3d)$ as $-6d^2$ instead of $6d^2$, and wrote $-(9)(-3d)$ instead of $+(9)(-3d)$ in the second line.

Correct solution:

$$(-2d + 9)(-3d) = (-2d)(-3d) + (9)(-3d)$$

$$= 6d^2 - 27d$$

20. I used the distributive property to determine each product.

a) $3m(2n + 4) = 3m(2n) + 3m(4)$
 $= 6mn + 12m$

b) $(-5 + 3f)(-2g) = (-5)(-2g) + (3f)(-2g)$
 $= 10g - 6fg$

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$$\begin{aligned}\text{c) } 7m(-6p + 7m) &= 7m(-6p) + 7m(7m) \\ &= -42mp + 49m^2\end{aligned}$$

$$\begin{aligned}\text{d) } (-8h - 3k)(4k) &= (-8h)(4k) + (-3k)(4k) \\ &= -32hk - 12k^2\end{aligned}$$

$$\begin{aligned}\text{e) } (-2t + 3r)(4t) &= (-2t)(4t) + 3r(4t) \\ &= -8t^2 + 12rt\end{aligned}$$

$$\begin{aligned}\text{f) } (-g)(8h - 5g) &= (-g)(8h) + (-g)(-5g) \\ &= -8gh + 5g^2\end{aligned}$$

22. a) Divide the shape into two rectangles.

One rectangle has dimensions $7x$ by $5x$.

Its area is $(7x)(5x) = 35x^2$.

The other rectangle has dimensions $(7x - 3x)$ by $(12x - 5x)$, or $4x$ by $7x$.

Its area is $(4x)(7x) = 28x^2$.

Add the two areas to determine the area of the composite shape:

$$35x^2 + 28x^2 = 63x^2$$